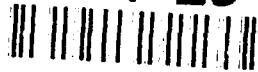


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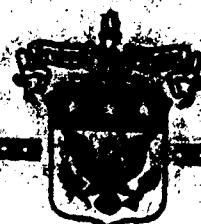
COMMAND, CONTROL, AND COMMUNICATIONS
AT THE VII CORPS: THE COMMAND AND CONTROL
INTEGRATION OF THE VII CORPS AND THE 1ST CORPS

Lieutenant Colonel MURRAY D. MCKEEAN
United States Army

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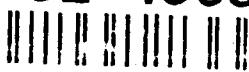
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Over thirty C3 lessons learned are contained in the study, covering tactics, techniques, and procedures to enhance heavy Corps TAC operations. While the author concludes that our warfighting doctrine is generally sound, Desert Shield/Desert Storm served as a C3 baseline for future heavy Corps MRC operations, and, as such, provided several joint and coalition warfare situations where "fixes" need to be applied to TAC functions for future MRC contingencies.

USAWC MILITARY STUDIES PROGRAM PAPER

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COMMAND, CONTROL, AND COMMUNICATIONS
AT THE VII CORPS TACTICAL COMMAND POST:
OPERATION DESERT SHIELD/DESERT STORM

AN INDIVIDUAL STUDY PROJECT

by

LTC David D. McKiernan, AR

Colonel Larry Goodwin
Project Advisor

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ABSTRACT

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The author will apply his gulf war experiences to analyze that C3 challenge from the perspective of the VII Corps Tactical Command Post (TAC), operating with a five Division-sized force and a large supporting combat/combat support/combat service support task organization. Starting with the environmental impact on a European-based Corps Headquarters faced with desert theater conditions, the study will focus on planning, preparation, and execution of TAC C3 functions in this Major Regional Conflict (MRC). Organizations, manning, training, and equipping of the TAC will be analyzed relative to the METT-T conditions of the theater campaign. Desert Shield, Desert Storm (both air and ground campaigns), and post-combat TAC functions will be addressed. While cutting across all seven Battlefield Operating Systems (BOS), the study will remain centered on C3 at the Corps TAC.

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INTRODUCTION

Not since World War II have larger concentrations of units maneuvered on a battlefield than during Desert Storm. VII Corps alone, totaling over 140,000 soldiers and five divisions, attacked over 300 kilometers in just 96 hours, fighting elements of nine Iraqi divisions, including the mechanized divisions of the Republican Guards. The largest U.S. Corps in history maneuvered in task force, brigade, and division battle formations that appeared as huge armored vehicle armadas across the desert. When the ground war started (G-Day), unit commanders had been provided the time to peak individual and collective training. Soldiers and their leaders were arguably the finest ever fielded in the U.S. Army. Airland Battle doctrine drove the campaign planning approach, Desert Shield preparations, and Desert Storm execution. Equipment ranged from 1950's technology in FM radios to the lethal weaponry of the last decade. Indeed, the fielding of the Army Tactical Missile System (ATACMS) was actually accelerated to provide its deep attack capabilities some two years ahead of schedule.¹

To command a Corps of this size, control the diversity of its combat/combat support/combat service support operations, and to communicate within a coalition operational framework, an unprecedented challenge was placed on the C3 architecture of VII Corps. The purpose of this paper is to analyze that C3 challenge at the Corps Tactical Command Post (TAC). Functionally organized to assist the Corps Commander in fighting the close battle, the VII Corps TAC, in reality, encompassed a

far wider range of C3 functions during Desert Shield/Desert Storm. Thus, the scope of this analysis will include the period from 14 December 1990, when the TAC became operational in theater, to 16 April 1991, when it stood down for redeployment to Europe. While primary attention will be given to the Battlefield Operating System (BOS) of C3, the other six (intelligence, maneuver, air defense, fire support, mobility/ countermobility/survivability (MCMS), and CSS) will also be addressed relative to TAC mission roles.

This military study will be organized in six parts. First, the operational "culture shock" of a USAREUR heavy corps TAC hitting the ground in a totally new theater environment will be discussed. As a late addition to the CENTCOM ground campaign, VII Corps learned very quickly the meaning of "contingency corps." Second, I will review the battle staff functions of the TAC as they evolved from a joint and coalition operational framework, and, of equal importance, as they reflected the Corps Commander's campaign intent. Third, I will cover the pre-ground war (G-Day) TAC C3 functions as the Corps projected combat power into tactical (and ultimately forward) assembly areas. The initial five weeks of the air campaign falls in this period. This phase, included the movement of the Corps to attack positions while simultaneously maintaining a deception "look," conducting raids, reconnaissance, and building up the CSS base. Next, in Chapter 4, the C3 complexities and challenges during the ground war itself will be addressed. Fifth, I will discuss the unique TAC post-combat missions/roles, or, more

specifically, from the cease fire until Corps withdrawal back into Saudi Arabia. Finally, I will conclude with what I believe to be the salient C3 lessons from the campaign for a corps TAC.

This organization is not intended to chronicle the VII Corps TAC during the campaign, but rather to analyze the functions, C3 roles, and lessons learned by a heavy corps in a high intensity desert joint and combined operation. Corps MAIN and Corps REAR Command Post operations will not be addressed. The "if I only had . . ." technology and force modernization C3 issues are likewise not the focus here. Rather, the focus is on why it was done this way with currently available assets, and what are the critical lessons to be learned to do it as well or better tomorrow under similar conditions. It is my hope that these lessons will validate certain parts of our training and doctrine, illustrate the need for changes in other areas, and provide a kind of "recipe" for campaign planners of future joint and combined operations of this scale.

The reader should know that I was neither part of VII Corps Headquarters before Desert Shield nor after 17 April 1991. I was attached in the interim period specifically to run the Corps TAC. Bringing no previous knowledge of VII Corps TAC personalities or organization, I truly "inherited" a command post as it initially existed in theater. From that perspective, I would suggest that I could be very objective in my approach to operations and, consequently, in this retrospective analysis. While I quickly "bonded" with the soldiers at the TAC, my prior assignment as a CTC observer/controller provided me some

doctrinal expertise and the freedom of action to change whatever I found deficient without any previous bias factor. Objectivity in this analysis is the point I am trying to establish.

A final introductory note. I feel it important to capture lessons learned for the reader as I proceed. Therefore, Corps C3 lessons will be numbered sequentially (example: C3 LL#1: . . .). I invite the reader, whether in agreement or disagreement, to consider each of these lessons learned. Any analysis of C3 functions, successes, and problems of the VII Corps TAC during the gulf war would be pointless in their absence. With that in mind, let me start on 15 December 1990.

CHAPTER 1

IN THE BEGINNING . . .

A. Environment

Joining the TAC at its initial in-theater operational site in Tactical Assembly Area (TAA) JUNO, I was immediately struck by the environmental differences between Europe and the desert on the organization, resources, and training proficiency of the VII Corps TAC. The learning curve was steep for all VII Corps units as they adapted to theater conditions, and the TAC was certainly no different. It is illustrative to highlight these differences. A heavy corps TAC in Europe can expect terrain familiarity, hard site availability with commercial power sources, in-country communications and life support infrastructure, line of sight communication requirements already profiled, and often wet conditions. Of equal importance, exercises (REFORGER, BCTP, etc.) never placed a "stand alone" prerequisite on a TAC battle staff. It was too easy to move back and forth between TAC and MAIN to exercise C3 over the battle. The normal modus operandi would be for the command group to fight the close battle by daytime from the TAC and move the MAIN at night to plan and shape the next day's fight. The conditions and rapid tempo of operations in Desert Storm would never allow that sort of flexibility, a reality that perhaps was never fully planned for in tailoring a TAC organization.

Saudi Arabia, on the other hand, provided a stark contrast in C3 challenges. Besides no terrain familiarity by maneuver

commanders and signal units alike, there was a marked absence of in-country infrastructure. If you didn't bring it with you to communicate, operate, or live with, you simply went without. In lieu of hard sites, survivability required digging into an extremely rocky subsoil. Sand replaced moisture as the number one climatic degradation. Finally, the TAC battle staff simply had to have a stand alone capability, the MAIN location was typically a half day's driving time away. Bottom line, a new set of conditions, coupled with an offensive ground campaign plan, required a different organization of the VII Corps TAC with a simultaneous training requirement. (C3 LL#1: Never hesitate to restructure, at the earliest time, a TAC tailored to the theater environment, the type campaign plan, and the Corps Commander's C3 imperatives.)

B. Manning

It would serve no purpose to describe the TAC "team" as it initially appeared. Suffice it to say it was not tailored IAW the above criteria. Allow me to jump right to a solution. Echelon a corps TAC in generally the same manner you would a maneuver formation, combat (in this case an operational "inside the wire" element), combat support (communications, protection, survivability), and combat service support (life support). (C3 LL#2: Tailor/echelon the TAC when you organize, man, and equip it.) In this case, based on the campaign parameters cited above, the optimal organizational "mix" was:

COMBAT (OPERATORS):

- ▶ operations cell (G-3)
- ▶ intell cell (G-2)
- ▶ fires/A2C2 cell (FSE, Army Aviation, ADA, Air Force)
- ▶ mobility/survivability/sustainment cell (Engineer, NBC, Logistics)
- ▶ attached liaison teams (addressed below)

COMBAT SUPPORT:

- ▶ tactical signal (Line of Sight and Tropo Systems, TACSAT, Retrans)
- ▶ military police and armored protection (for this campaign, two M1A1s and two BFVs)
- ▶ air defense (for this campaign, a Stinger section)
- ▶ survivability assets (digging equipment, i.e., dozers/CEEs attached for the duration, not "borrowed" from the nearest engineer unit)

COMBAT SERVICE SUPPORT:

- ▶ fuel, medical, maintenance, mess, and transport capability

The exact composition of the above organization could easily become a study unto itself. TAC spaces have been discussed to this point; now "faces" will be addressed. Three overriding prerequisites should ideally answer the "where they come from" questions: tactical and technical expertise, habitual organizational/ training relationships, and, in several cases, the capability to work "dual hatted." Let me explain each of these. First, the expertise requisite emanates from the

"one deep" nature of the TAC. The nature of Modified Tables of Organization and Equipment (MTOEs)² and the need to tailor the TAC to campaign needs do not inherently provide for a very robust organization. Indeed, the TAC will always lack the redundancy in functional spaces found at the Corps MAIN. Additionally, the great bulk of the planning is done back at the MAIN, and what Fragmentary Orders (FRAGOs) do originate from the TAC are generally the purview of the Corps Commander and his G-3. Therefore, TAC personnel must be consummate "operators" and coordinators. They must possess the tactical, technical, and organizational savvy to work off of the basic OPORD, synchronize Battlefield Operating Systems (BOS), and monitor the battle (a detailed analysis of TAC functions will follow in the next chapter)--hence, the expertise factor.

Second, the Corps G-3 Training (G-3T) section habitually has the TAC responsibility. It is a sound linkage. G-3T are "operators" in peacetime corps training functions, and its preponderance of combat arms MOSs are ideally suited to execute the physical TAC functions and operate the associated equipment. A strong case, however, can be made for "dual hatting" other TAC battle staff functions, which is the third point to be made here. By that I mean going outside the Corps Headquarters to man the space. With the multitude of liaison missions VII Corps had within the theater, all "out of hide" Corps Headquarters requirements, there simply was not enough MTOE spaces to cover TAC/MAIN/REAR needs. In a joint and coalition campaign, those liaison missions included the coalition operations center (C3I),

ARCENT HQS and ARCENT (FWD), XVIII Airborne Corps, and the Northern Area Command (NAC), among others. With that in mind, and the operator/coordinator versus planner premise, certain other battle staff functions could be facilitated by filling them with good staff officers from subordinate Corps units. While the G-2 and FSE functions can be manned with Corps Headquarters personnel, the following were "dual hatted" spaces:

ADA = TF8-43 (Corps Hawk/Patriot battalion)

AVN = 11th Aviation Brigade

ENGR = 7th Engineer Brigade

LOG = 2d COSCOM

Some readers might oppose this manning scheme, arguing that subordinate units should not have to man the Corps TAC, but there is actually a double benefit from this approach. The TAC gets good operators, familiar with the leadership and organization of the unit headquarters they will be coordinating with to synchronize the fight. The unit, on the other hand, has a "friend in court," fully knowledgeable of their capabilities and mission concerns as well as an "insider's" knowledge of the Corps' concept of operations and Commander's Intent. The Army Aviation staff officer, for example, had an intimate operational handle on available systems, REDCON levels, mission window cycles per battalion, current FARRP status, and night vision goggle qualified pilots, plus the established credibility with the 11th Aviation Brigade Commander/staff, to enhance the tactical expertise otherwise expected. Knowing the right questions, who to expeditiously answer them, and expertly

manage/coordinate/synchronize that information in the Corps' operational context resulted. In rapid tempo combat operations, that is a winning combination for immediate, accurate information to provide the Corps Commander/G-3. (C3 LL#3: Consider manning selected TAC battle staff functions with officers from Corps Troops units.)

C. Liaison

Let me now return to the issue of attached liaison teams to the TAC--a double-edged sword. Subordinate Commanders doctrinally are required to maintain liaison with their higher headquarters, and for all the right reasons. Due to the long distances in the theater of operations (TO), that meant LNOs to both the MAIN and the TAC. With flank unit liaison and LTG Yeosock's concept of ARCENT liaison teams,³ that total of LNOs simply overwhelmed the TAC, including teams from five divisions, XVIII Airborne Corps, and ARCENT. Besides adding to the size, signature, and life support needs of the TAC, four of the five division teams were not self-sufficient in communications, and all felt the need to be "near the mapboard" to get timely information for their respective bosses. Another negative was in the "first report is always wrong" category, i.e., passing intelligence reports before they could be verified, or orders before they were finalized and approved, often leading to a "ripple effect" in false information and the consequent disharmony between staffs.

Part of the LNO answer lies in disciplining and training an LNO system, but two overall options for future campaigns emerge in retrospect. The first is to institutionalize operationally self-sufficient LNO teams at all organizational levels, resourced in the MTOE, trained in peacetime, and specifically addressed (who provides what to whom) in each level of OPORD. The second alternative may sound radical, but would certainly conserve resources without degrading the liaison intent. That would be for the Corps Commander to say, in effect, "Division Commander, give me a good officer to work in my TAC for me (an operator), and he will still perform your liaison requirements." Thus, the TAC's size is not compromised, there is greater redundancy in operators, and the same positive benefits as with the "dual hatted" staff officer cited above are accrued. One negative aspect of this proposal would be the potential travel limitations, e.g., an LNO's displacement to and from his organic headquarters. (C3 LL#4: Establish and institutionalize precise LNO systems in our doctrine and resource requirements documents. Do not let the LNO structure evolve on its own.)

D. Equipping

As stated in my introduction, I do not intend to enter into a lengthy discussion on C3 technology. C3 functions in a joint and coalition ground campaign are the focus here. Suffice it to say that we, the Army, have not kept pace in C3 equipment compared to weapons systems modernization. The VII Corps TAC was centered around a nucleus of six M577A1 Command Post tracked

vehicles which are inadequate dinosaurs on the mobile battlefield of the M1A1, BFV, MLRS, etc. (C3 LL#5: Relative to C3 functions, the TAC's equipment must reflect three imperatives in controlling and communicating on the airland battlefield: mobility, protection, and communications reliability/redundancy.) Let me briefly elaborate on each.

TAC vehicles must have the mobility to keep up with brigade/division battle formations. The Corps TAC always moved within or adjacent to such formations during the ground war. It must possess organic protection against indirect and aerial fires, and, worst case, direct fires. Finally, it must have environmentally reliable and systems-redundant voice and record communications for the Commander to command his subordinate units. The TAC exercised adequate C3 during Desert Storm, as will be shown in later chapters, but it was oftentimes downright ugly, and usually meant working through equipment inadequacies. Trucks (especially those hauling anything), signal vans, generator trailers, and CUCVs made even the M577A1 look mobile in the desert. Although we never received any effective incoming artillery fire, the canvas M577A1 extension would have had zero protective value. To anyone who says the solution is a "ramps up" configuration, he/she has obviously never seen the size or equipment requirements inside a corps TAC. Although digging in the TAC obviously aids protection, the time available in an attack/pursuit-type offensive operation such as the VII Corps executed will simply not allow that measure at most post-LD/LC locations.

Finally, and probably the greatest area of equipment problems, the communications system within the Corps was nightmarish. Beyond the LD/LC, FM radio and tactical satellite (TACSAT) systems were the only means available common to all Corps major subordinate units. In fact, as will be discussed later in this study, the Corps Commander's most efficient means to exercise effective C3 over the Corps during battle was in a UH-60 Blackhawk with sophisticated communications console.⁴ Even then, he found it oftentimes necessary to land and physically give orders/directions face to face with Commanders. Line-of-sight telephone nodes were 12-24 hours behind the attacking divisions, no secure facsimile (record comms) equipment compatibility existed across the Corps, C3 systems such as MCS and MSE were not common to all Corps units, and FM was only as good as the height of your antenna, i.e., no retrans network. All these degradations obviously impacted on the TAC's ability to synchronize the close battle, as Chapter 4 will show.

What I would propose to the reader for the equipment dilemmas outlined above is a rather simple, affordable conceptual solution. Use existing technology and already fielded equipment to develop the mobile, protected C3 vehicle needed for airland operations. For example, take a BFV chassis with a kevlar canopy (and a kevlar extension) and configure it to accommodate the electrical and communications command post requirements. Employ a telescopic antenna system that can be quickly operated entirely from within the vehicle. Outfit it with SINCGARS and TACSAT single and multichanneled systems, as

well as a resilient, secure facsimile system for record comms (orders, overlays, etc.). Innovative combat developers could easily add the other essentials such as built-in Ground Positional System (GPS) equipment, auxiliary power units (APUs), durable and collapsible mapboard/information displays, and so on. It can't be that difficult or dollar intensive in comparison to the C3 payoffs! (C3 LL#6: **Modify existing equipment to field an upgraded C3 vehicle to replace every M577-series command post tracked vehicle from task force through corps level.**) (C3 LL#7: During Desert Storm, single and multichannel TACSAT were winners at Corps level--the rest were not. A durable, fast-operating, secure FAX machine should be a priority C3I fielding priority for the Army now).

C3 equipment considerations will continue to surface throughout the rest of this study; however, the observations above need to preface the wartime functioning of the VII Corps TAC. The final C3 area worthy of review as the Corps initially concentrated on projecting combat power into the theater is training, so let us shift gears to that subject.

E. Training

In the next chapter, TAC wartime functions will be discussed at length. One of those functions, training, started on day one of my attachment to the TAC. During the initial campaign phase of building the Corps' combat power in TAA JUNO, the TAC did not have to execute its full complement of battle functions, allowing training time to ingrain operational

cohesion into the basically new organization described earlier. Monitoring convoy movements out of the SPODs, receiving unit closing reports in the TAA, and tracking combat power were the primary TAC missions. The C3 focus was still exclusively at the MAIN where the battle plan was being finalized and coordinated. Additionally, the Corps Commander stayed at the MAIN (until 17 January, Desert Storm D-Day). All these factors provided an excellent opportunity for the TAC to execute totally battle-focused training.

Again, under the heading of operating in a different theater environment, certain fundamental deficiencies had to be resolved through good training. Vehicle load plans were too "heavy," reflecting a European hard site CP mentality, and thereby degrading mobility. Desert specific fieldcraft and navigational techniques were lacking. Nobody was used to digging in the TAC. The TAC signal platoon struggled with establishing timely communications without the line-of-sight profiling data always available for European exercises. A desert movement formation had to be developed and practiced. How to communicate via FM over the extended distances within the Corps sector immediately became a training challenge. Maintenance techniques under desert conditions were an acquired skill. Finally, and of the highest criticalness, this "new" battle staff had to train to become a cohesive, functional team whose characteristics could reflect the tenets of airland battle: initiative, agility, depth, and synchronization.⁵

Most of these challenges were met through a combination of team building and realistic, repetitive training, always followed by that basic tenet in our training doctrine, the after action review (AAR). Training concentrated on three general areas: operations (battle staff situations), displacement drills (echeloned jumps, movement formations, priorities of work), and individual and collective fieldcraft skills. (C3 LL#8: Train and refine C3 skills at every opportunity right up to the LD/LC, and continue to cross-train even beyond that. Training continues in combat.) By the night the air war started, the TAC was working as a synchronized battle staff, could displace rapidly and maintain control and communications, protect itself, and effectively sustain itself in the desert. That's not to say some "warts" were not still present, but the point is that a Corps TAC must train just as hard as a maneuver task force in the time available before the battle.

I have attempted to set the operational C3 "stage" for the VII Corps TAC as it existed upon arrival into the theater. The nature of the environment and the operations plan drove the manning, liaison, equipping, and training requirements for the TAC and its C3 architecture. As a USAREUR based Corps, the many lessons in tailoring a TAC organization to meet this theater's METT-T considerations had to be largely learned and implemented during that valuable TAA build-up time before Desert Storm. In the next chapter, I will turn to the specific TAC C3 functions for the ground campaign.

CHAPTER 2

THE CORPS COMMANDER'S C3 NEEDS

A. The Commander

This chapter addresses Corps TAC C3 functions as they evolved for Desert Storm. The title of the chapter is significant in itself. Doctrine aside, a Corps TAC will reflect in its organization, manning, and functions, the personality, location on the battlefield, and particular C3 information desires of the Commander himself. In the VII Corps case, the Commander articulated some very clear Commander's Intent to "shape" the planning, preparation, and execution of Desert Storm. Additionally, he clearly intended from the outset to fight the battle forward (from the TAC), and also possess the capability to move to subordinate Commanders' locations to influence the action. Thus, the TAC had a very good framework from which to organize battle staff functions early on in the campaign. In this chapter, my intent is to trace the linkage between the Commander's C3 needs to TAC functional C3 objectives, and, finally, to specific battle staff functions.

I will expand on this linkage in three parts. First, a review of the Commander's Intent will be provided. These imperative events were actions or organizational concepts he considered key to a successful ground campaign. It is not, however, my intent to review the entire VII Corps concept of the operation for the ARCENT main attack. I will assume the reader has some understanding of the basic scheme of maneuver and

fires. If not, there are a multitude of other sources to provide that operational chronology.⁶ The focus here will remain on the C3 system. Second, taking those imperative actions, I will address the overarching TAC C3 functions as they were developed prior to D-Day. Third, I will lay out the specific battle staff functions in a cellular format based on the TAC organization covered in the preceding chapter. Later chapters will address how well or how poorly those functions were executed prior to D-Day, during the air campaign, and during the ground war itself.

Some readers may consider this process of defining or focusing TAC C3 functions based on the Commander's needs as a "blinding flash of the obvious," but let me offer two counterpoints. First, I have too often seen "generic" C3 nodes in TACs, MAINs, REARs, FORWARDs, etc., that were organized without any planned linkage to that particular Commander's personality and informational requirements. Additionally, their planned functions may have been settled on without any real knowledge of the battle plan or the Commander's intent on how he will fight the corps. The result can be a C3 effort out of synchronization with what the Commander expected, or, worse yet, dysfunctional. In other words, the particular fighting concepts of a campaign or operation should drive specific C3 functions, and, while some functions may never change from one operation or theater to another, others most certainly will, even between two heavy corps TACs within the same theater of operation. This functional relationship should be developed in a C3 "center of

gravity" thought process. Second, I would stress that this C3 functional development is an iterative process that will refine itself over time. Again in the VII Corps case, the many operational situations and reports that caused some degree of a C3 "spin up" at the TAC, prior to Desert Storm, served us well in this regard as the battle staff "grew into" well-defined functional roles. Examples of this will be shown in the next chapter. (C3 LL#9: Define specific TAC C3 functions based on the Commander's personality, his planned location on the battlefield, and the fighting concept he has identified.)

B. VII Corps Commander's Battle Intent

Before detailing the Commander's Intent, the VII Corps operational plan (OPLAN) should be placed in context to the ARCENT ground campaign. As the main effort attack in the ARCENT area of operation, VII Corps devised a six-phased OPLAN with the destruction of the Republican Guard Forces Command (RGFC) as its end state objective. Those phases can be summarized as follows: (1) build up and project combat power into TAA JUNO; (2) move the Corps to attack positions in FAA UTAH while simultaneously conducting reconnaissance, "setting" the deception look to include artillery/AH-64 raids, and establishing CSS forward logistics base sites; (3) penetrate Iraqi defenses in sector and envelop simultaneously (G-Day); (4) defeat the Iraqi tactical reserves (2d echelon Brigades/ Divisions) in sector while preserving the force; (5) destroy the operational reserve (RGFC,

10th and 17th Armored Divisions):⁷ and (7) be prepared to execute any of a series of on order, follow on contingencies.

Given that phased operational plan, the Corps Commander articulated his imperative fighting concepts as:

- ▶ Plan for a non-linear battle to force the enemy to have to fight, in depth, a penetration and envelopment simultaneously.
- ▶ Synchronize the close and deep battles, to include keeping task organization changes to a minimum.
- ▶ Enhance agility by organizing logistics task forces (LTFs) and DS/GS artillery to move within Divisional maneuver formations.
- ▶ Emphasize "zone of action" graphical control measures to provide maximum freedom of action and initiative for subordinate commanders.
- ▶ Maintain the momentum of the attack to fix and destroy enemy units, while concurrently "setting up" (shaping) the next fight and conducting sustainment operations.

C. TAC C3 Functions

Given the operational framework outlined above, certain functional C3 TAC missions became evident. First, in the fluid battlefield planned for, TAC mobility, continuous provision of communications links, and situation "snapshots" became TAC specified tasks. Furthermore, we anticipated a "blurring" of close/deep battle actions which would require our ability to coordinate both in a rapid tempo offensive operation. Second,

while minimal task organization changes were desired, the TAC had to remain focused on the Corps' main effort, and, in doing so, have the information necessary to recommend any shifting of combat power across the spectrum of Battlefield Operating Systems. That could entail shifting Corps Artillery assets, targeting input, refueling priorities, air defense coverage, and so on. In other words, it was critical that, in addition to the battlefield "snapshot," the TAC maintain accurate, timely status of Corps combat power relative to operational opportunity. As the preceding chapter alluded to, this included logistical operator presence forward at the TAC. Any significant decision the Commander would make, close or deep, had major logistical implications. Thus, while all the battle staff had to integrate logistics in their functional roles, we felt an additional logistics operator, intimately familiar with the COSCOM organization, was vital to the TAC. (C3 LL#10: **Insist on COSCOM or Corps G-4 representation forward at a Corps TAC during an offensive campaign.**)

Third, given the freedom of action that the Commander wanted subordinate commanders to operate within, and the corresponding absence of overly restrictive graphical control measures, it became incumbent upon the G-3 and the TAC to ensure that both fires and maneuver were coordinated. This obviously comes under the heading of synchronizing the battle. For fires, this placed a premium on the TAC's recommendation of exactly where the Fire Support Coordination Line (FSCL) should be at any time during the operation. The permissive nature of joint

air/ground fires beyond the FSCL, together with the coordination requirements short of it, make the FSCL an absolutely critical control measure at Corps level. (C3 LL#11: In a fluid battle environment, the Corps TAC must be the focal point for delineating the FSCL--its "pulse" on units in contact and the FLOT is informatively superior to that of Corps Artillery or the Corps MAIN.)

Concomitantly, this freedom of action and its implied mission-type orders require a C3 structure that clearly understands the Commander's Intent, translates that direction into unambiguous orders, ensures subordinate units acknowledge those orders, and supervises (and synchronizes) the preparation/execution of their contents. In a joint and coalition operational theater, that is no easy task. While the basic Corps OPORD for Desert Storm emanated from the MAIN, the issuance of FRAGOs in support of combat operations was the TAC's business. The functional lesson learned was clarity in directions to subordinates. Orders come from the Commander or his G-3, but the dissemination, requirements to clarify any portion of their contents, ensuring receipt and compliance acknowledgement, and coordination of effort across the BOS spectrum is a battle staff responsibility. (C3 LL#12: As basic as it may sound, acknowledgement and coordination/supervision of orders is just as critical in troop leading procedures at the Corps level as it is at the task force level.) Therefore, these FRAGO responsibilities, based on the Commander's concept of freedom of action, became a C3 mission essential task for the

TAC. As I will show in the next chapter, the TAC would get an invaluable workout on the FRAGO process well before D-Day.

In summary, the Commander's warfighting intent translated into the specified and implied TAC C3 tasks described above. Turning to specific battle staff functions in the next section, it is important for the reader to understand that each was formulated within the C3 operational framework provided by the Commander's Intent, i.e., taking the linkage one level lower.

D. Battle Staff (Cellular) Functions

FM 100-15 lists generic TAC functions, applicable to any operational setting.⁸ This section will itemize a more refined summary of battle staff functions per the cellular organization described in Chapter 1. While I have excluded the details on some TAC functions, such as security, maintenance, and other "housekeeping" type requirements, I would suggest that the following represents a fairly comprehensive listing of offensive operational C3 functions for the Corps TAC, or at least a "menu" that a Corps G-3 could select from to structure TAC battle staffs under similar METT-T conditions.

(1) INTELLIGENCE CELL: (see Note 1 below)

- ▶ Update Corps IPB Products
- ▶ Analysis of "close battle" enemy situation/vulnerabilities; (same for) tactical reserves; (same for) operational reserves
- ▶ Provide Commander likely enemy courses of action (COA) and their respective indicators

- ▶ Input to the targeting process

(2) OPERATIONS CELL:

- ▶ Monitor major subordinate unit movements/closures
- ▶ Track combat power (Commanders' SITREPS and other information updates); make recommendations in shifting combat/combat support resources
- ▶ Maintain an accurate plot of the Forward Line of Troops (FLOT) and all Corps graphical control measures (see Note 2 below)
- ▶ Display current task organization and track any changes effected
- ▶ Continually update and disseminate flank and higher unit tactical situation
- ▶ Disseminate, track acknowledgement, coordinate/deconflict, and supervise preparation/execution of all Corps Commander FRAGOs (see Note 3 below)

(3) FIRES/A2C2 CELL:

- ▶ Track tube and rocket artillery combat power, including any ammunition constraints, and display current artillery organization for combat
- ▶ Track friendly and enemy range fans based on current battle information/locations
- ▶ Display all permissive and restrictive fire control measures; recommend shifts in the FSCL
- ▶ Track status of special artillery munitions (MLRS, ATACMS)

- ▶ Provide Corps-relevant Interdiction/Close Air Support targeting information from the daily Air Tasking Order (ATO)
- ▶ Divert or mass available AF sorties, based on combat situation and Corps Commander's orders, via targeting and airspace coordination with the Airborne Battlefield Command and Control Center (ABCCC)
- ▶ Coordinate and deconflict, as required, deep attack control measures and execution
- ▶ Track Army Aviation combat power, selected ammunition (ex: Hellfire) status, and crew cycles by unit (Divisional and Corps attack battalions)
- ▶ Track availability of any special Army Aviation assets, e.g., CH-47s, OH-58Ds, FARRPs
- ▶ Maintain current A2C2 control measure status
- ▶ Display and ensure dissemination of any change to air defense Weapons Control Status
- ▶ Display current high-to-medium-altitude (HIMAD) and short-range (SHORAD) air defense umbrellas
- ▶ Provide the Commander significant weather effects on any of the above

(4) MOBILITY/SURVIVABILITY/SUSTAINMENT CELL:

- ▶ Current MSR, Army airfield, FARRP status
- ▶ Maintain critical CSS asset locations. Probable focus on fuel (CL III), ammunition (CL V),

casualty evacuation (CASEVAC), and maintenance activities

- Track current Mission-Oriented Protective Posture (MOPP) level, make recommendations to the Commander, and track chemical monitoring results across the Corps battlefield and flank unit sectors
- Coordinate any emergency resupply requests received over tactical communications nets

(Note 1): The intelligence cell functions rely partially on assessing subordinate unit reports, but, to a large degree, are dependent on information supplied from the MAIN. In the absence of TAC downlink equipment from Corps or EAC intelligence gathering means, that information must come forward from the MAIN's All Source Intelligence Center (ASIC) or a similar organization. Timeliness and reliable communications links are essential for this transfer to occur. This dependence became a problem area in the rapid tempo of Desert Storm ground operations, as will be discussed in later chapters.

(Note 2): (C3 LL#13: The TAC must require, constantly update, and post major subordinate unit (Division and ACR) graphical control measures, to include immediate flank units. The payoff is twofold: (1) enhances clarity of reports received during combat operations, and (2) allows the TAC to deconflict control measures, e.g., significant boundary differences. Multicolored posting is one technique to quickly relate graphics to establishing headquarters.)

(Note 3): By the very nature of mobile airland battle C3, the TAC is often not the physical location where the Corps Commander issues orders/direction during combat. TAC supervision of the FRAGO process assumes the knowledge of the order's contents, which is not always the case. A FRAGO may well be given at a Division TAC by the Corps Commander. The point to be made here is that a feedback mechanism must be in place for these situations. While the Corps Commander will always attempt to provide that feedback, other techniques should be planned for (G-3 operator accompanying Command Group, aide-de-camp, etc.)

A final note on TAC C3 functions to close out this chapter. There is a redundancy in sources of information for the TAC to execute most of the C3 functions addressed above. For instance, just to accurately track the close battle friendly situation requires input to all of the TAC cells and a synthesis of information across them. The key ingredient in this process is battle staff "crosstalk." Again, like orders supervision, it is a concept just as critical at the Corps level as the task force level. (C3 LL#14: TAC physical configurations, communications organization, staff training, personalities, and information sharing procedures/techniques must all be developed to facilitate the requisite battle staff crosstalk.) Indeed, there are always times when some sort of organized TAC "huddle" is called for to synchronize and share functional information, and to prioritize further C3 information needs.

CHAPTER 3

PRE-GROUND WAR TAC C3

A. Time Available

Of the METT-T factors, time is usually the one you have the least control over. In the VII Corps TAC's case, we fortunately ended up with about eight weeks to "ratchet up" our functional C3 skills before crossing an LD/LC. To this point, I have concentrated on defining those functions within the operational context of Desert Shield/Desert Storm. With this chapter, the discussion will shift to application, together with the associated strengths, weaknesses, and lessons learned. Specifically, the period of projecting combat power forward to pre-attack positions, defend (force protection) contingencies that ran concurrently with preparations for offensive operations into Iraq, pre-ground attack combat and training activities, and that of the air campaign's initial five weeks will be covered. Throughout, opportunities to refine TAC C3 functions for the Corps' offensive operation abounded in legitimate pre-G-Day missions. These were in addition to the purely "TAC training" time that was described in Chapter 1.

B. Pre-Combat Activities

Prior to the night of 17 January, the TAC's C3 missions focused on monitoring unit movements from the ports and closure into TAA locations, terrain management, local defense and contingencies to defeat any Iraqi preemptive attack into Saudi Arabia, exercising Corps communication links and reporting

systems, and subordinate unit training to prepare for combat operations. Each is worthy of further discussion. First, the sheer distances involved in convoy movements to the TAA severely limited C3, roughly 470km from the port of Ad Dammam and slightly less than 400km from the port at Al Jubayl. The majority of these moves occurred before or during the establishment of a Corps communications infrastructure. So while the TAC mission of tracking closures was certainly a valid one, the distances were greater than the means to reliably communicate. The information will ultimately get to the Commander, but if you want it timely, accurate, and seek to minimize lost convoys, recovery time, etc., then you have to work a C3 system around the environmental challenges. Assuming that intratheater movement must commence before a line-of-sight communications infrastructure can be matured, due to either equipment arrival schedules or protection of those signal nodes, reliable alternatives must be developed. FM and courier is only a short-range answer. (C3 LL#15: Given that movements from APOD/SPODs will occur in a Corps AO that lacks a matured communications infrastructure, consider the following C3 technique: (1) CSS "rest stops," secured and linked into multichannel TACSAT net to report movement status, (2) locating a C3 site, the Corps TAC for example, at or near a Corps Release Point, and (3) provide dedicated aviation assets at the TAC to monitor unit moves/closure into their respective TAAs and to facilitate terrain management.) Thus, a C3 system can be effectively established to control movement into the TAA and

provide the requisite information back to the Corps MAIN/Command Group prior to their departure from a port location.

Terrain management relative to TAC C3 functions evolved into a double-edged sword. C3 of the TAA was a relatively simple process as subordinate units deployed out to the desert and developed their battlefield operating systems. The planned graphical control measures to organize the terrain for assembly areas only were certainly adequate. What encumbered the control were two things. First was the evolvement of training facilities, specifically live-fire ranges, to meet the pre-combat training needs of Commanders. Although I will discuss in detail what that involved later in this section, suffice it to say that the administrative functions necessary to control those facilities were not compatible with the battle staff control required for "close battle" at this phase of the campaign, defend in sector.

The second lesson in TAA terrain management involved the concurrent nature of two missions--occupy a TAA and defend in sector. The premise of a defend mission was based on the force protection task while combat power was projected forward and preparations completed for Desert Storm. On a strategic theater level, that was the mission for XVIII Airborne Corps in Desert Shield as the CINC projected ground combat power into the Kuwaiti Theater of Operation (KTO).⁹ VII Corps' force protection needs required that same mission on the operational level, just as local security is the first priority of work for any unit move on a tactical level. While that mission was accomplished,

our prior planning lacked the depth to provide detailed subordinate unit tasks and control measures beyond a 2ACR screen line. The C3 lessons (LL#16, #17, #18) are threefold: (1) establish a Corps facility to solely provide the C3 to initially defend against a "worst case" enemy situation, which is, in effect, the Corps Commanders close battle at this point--the TAC is the logical choice; (2) use another headquarters element to control the remainder of the TAA (and the build combat power mission) behind a forward defense zone, the MAIN or even the Corps REAR; and (3) provide, from the start, graphical control measures from which to simultaneously defend, occupy a TAA, and facilitate future operations (in this case, the move to attack positions in Phase II of the Corps' OPLAN.)

This last lesson is worth expanding on. I think it is reasonable to assume that any future major regional conflict involving the U.S. as a coalition member will mirror the first two phases of Desert Shield/Desert Storm on an operational level, i.e., project combat power into the region and move to terrain that will favor initiation of offensive operations. What we found in Saudi Arabia is that there was no "clean break" between phases, and the requirement to defend was intrinsic to both. Furthermore, once the TAA starts to mature, it becomes exceedingly difficult to continuously issue fragmentary orders with defend mission graphics or overlay such graphics onto purely terrain management-oriented TAA graphics. What I am suggesting to the reader is planning a forward defense zone, and providing the associated graphical control measures, to protect

combat power build-up in the TAA. Furthermore, the need will exist to establish a Corps C3 headquarters dedicated to the close battle mission of the moment, defend. Obviously, unit arrival schedules (into the TAA) and consideration of future movements (flowing the Corps into attack positions) factor into the planning. The payoffs are "cleaner" C3 lines and synchronized force protection planning at probably the most vulnerable time for ground forces, getting out of the ports and consolidating/organizing combat power forward. The whole point is to produce graphical control measures to concurrently defend from, occupy a TAA, and facilitate future movement.

Turning to the pre-combat "warming up" of Corps reporting, communications links, and the TAC's C3 role in both, hindsight indicated problems in both reporting and reliability of communications links that would degrade C3 during the ground war. The Commanders SITREP, due four times daily to the TAC from all major subordinate units, was formatted basically the same as most heavy divisions/corps use Army-wide. While its thirty to forty lines of information are necessary to track Corps combat power status, it is simply unmanageable to expect it accurately every six hours in hard copy in a mobile combat operation. Indeed, we had difficulty receiving it once or twice daily in the TAA. The reasons are threefold. First, an incompatibility of facsimile equipment existed Corps-wide. This would come back to haunt our C3 efforts during the ground war. Incredible as it may seem, at no point during Desert Shield/Desert Storm could the VII Corps Commander fax a single

page of orders to all Divisions and the ACR. E-Mail was fairly reliable in a static situation, but impractical once continuous offensive operations commenced. (C3 LL#19: Corps C3 requires environmentally durable facsimile equipment, adaptable to multichannel TACSAT communications, common across Corps units down to the brigade level.) Second, as at any level of command, the Corps reporting system must be disciplined when response times are not met. Finally, (C3 LL#20: An abbreviated combat power SITREP should be routinely used to report major weapons system availability, conducive to FM or single channel TACSAT reporting, with the other combat power ingredients reported by exception, i.e., when there are significant problems which impact on mission accomplishment.) The application to rapid tempo operational situations, mobile (versus relatively static) comms links, and net calls is obvious.

Another pre-combat note, but a critical one, should be made on communications links at the Corps level. From the very outset, the Commander clearly prioritized FM as the primary means for C3 of the close battle. We struggled making that system work in the expanse of the TAA, and would later struggle to make it work in Iraq. What would have facilitated the effort was an effective use of retrans capability. While the equipment capability was available, we were consistently unable to make good use of retrans frequencies. The issue was one of training. Opposed to task forces and brigades, which must learn to effectively employ retrans assets at the CTCs and elsewhere, VII Corps was not used to working that subsystem. Hardwired CPXs

and BCTP exercises that did not "stretch" FM comms had made this virtually a lost art at the Corps level, both from a signal brigade and tactical headquarters standpoint. Retrans teams had technical difficulties, were routinely sent out totally on their own to establish sites without any "what if" contingencies, and could usually only talk to another retrans team (which routinely led to a series of prolonged "commo checks" across the command net). Units, in turn, were reluctant to use the system, i.e., go to the retrans frequency, and even double retrans setups failed to extend the FM reach. I personally did not place enough emphasis on making retrans work in the TAA, and subsequent "jerry rigged" solutions resulted at G-Day (next chapter). (C3 LL#21: Retrans must be part of a Corps FM command net architecture for it to work over extended distances; furthermore, it must be routinely integrated into peacetime training, at all levels, as a tactical SOP C3 function.)

The final pre-combat TAC function revolves around the control of subordinate unit training, specifically live-fire, prior to hostilities. While this may be a peripheral issue, i.e., more of an administrative than C3 role, I feel it worthy of some discussion. With the VII Corps G-3 Training staff comprising the majority of the TAC operations section, the peacetime to wartime transfer of training responsibilities seemed logical on the surface. The training environment contrast between Germany and Saudi Arabia, however, exacerbated the establishment, resourcing, and control of training facilities. On the tactical/operational level, this C3 function

provides some interesting lessons for future campaign planning in similar regional conflict scenarios, i.e., time and space to conduct live-fire training prior to combat. The issue becomes much more involved than someone serving a "range control" function for Corps training ranges.

Back in Europe, where units were scheduled into training facilities and resourced (ex: ammunition allocations) on an annual basis, the coordination required to conduct live-fire training was relatively lock step. Range fans, safety danger zones, impact areas, maximum ordinance heights, airspace coordination, etc. had been established and routinely institutionalized. Establishing like facilities, with their respective safety criteria, capable of firing the full spectrum of weapons from small arms through MLRS, in Saudi Arabia presented new challenges in host nation support (HNS) coordination. Range approval by the Saudi government, local approval by the owning Emir, constant range limit checks to guard against entry by friendly units, local Saudi nationals, Bedouin tribesmen, and so on, became a daunting task prior to conducting live-fire training. This was a vital task, however, in order to provide the tactical and psychological benefits to crews/units firing their weapons systems before entering combat. I am convinced that calibrating tanks with depleted uranium SABOT rounds, practicing massed artillery fires, shooting HELLFIRE missiles from AH-64s, and other training not feasible on this scale during peacetime, directly related to the

overwhelming accuracy and lethality evidenced in the later ground war.

Additionally, the training C3 function entailed resourcing ammunition requirements. Again, as opposed to Europe, this was a cumbersome task. First, certain types of training DODAC ammunition had to be shipped from European or CONUS depots. On the other hand, if it was service ammunition, a Commander decision was necessary since the amount usually had to come out of Tier 2 of 3 stocks. Second, the ammunition had to be traced at the APOD/SPOD and "fenced" by the Corps headquarters. Next, transportation assets had to be reprioritized to expeditiously ship the ammunition forward to logistic base site(s) proximate to the range facility. Finally, amounts had to be apportioned based on available combat strength to begin training, COSCOM and units notified to coordinate release and pick up, and ammunition expenditures tracked to identify any lot number problems. Many opportunities existed in that loop for coordination and timing breakdowns.

I have reviewed this process not to bore the reader, but rather to provide a factual background to suggest an alternative to pre-combat training C3. Given that the TAC's C3 focus should remain directed toward the "close" tactical situation, here the defense, the deception execution, and the conditions along the Iraqi-Saudi border, the requisite training coordination function occurring back in the TAA should reside elsewhere. (C3 LL#22: Consider using the Corps MAIN, or even the REAR CP, as a TAA training C3 node, allowing the TAC to remain C3-focused on the

immediate tactical situation along the FLOT. HNS, friendly unit, and resource coordination processes to conduct live-fire training detract from that C3 battle focus.)

C. The Air Campaign

During the night of 17 January, coalition forces unleashed an air campaign of strategic and interdiction targeting unprecedented in accurate lethality and sustained tempo. That night also held great C3 importance at the TAC for another reason. The Corps Commander and G-3 now made the TAC their operational location, and remained based from there until the Corps ultimately withdrew from Iraq. Any further battle staff training at the TAC now occurred under "game conditions." C3 priorities now focused on preparing the Corps' sector of operations through: (1) interdiction fires; (2) intelligence collection; (3) "setting" a deception look to portray an attack up the Wadi-al-Batin approach adjacent to the Iraqi/Kuwaiti border, to include artillery/aerial raids; and (4) finalizing preparations for the attack, culminating in a Corps movement 60-100km westward into attack positions.

While the first two priorities above were not primarily TAC C3 functions, they certainly impacted on the Commander's ability to shape the coming close battle. Therefore, let me briefly discuss two specific aspects, interdiction targeting and battle damage assessment (BDA), which had C3 implications at the TAC.

The execution of AF interdiction targeting, both before and during the ground war, was doctrinally correct in focusing on

what will soon be institutionalized as Joint Battle Area imperatives of the "shaping area."¹⁰ The RGFC, as the operational center of gravity, and other priority targets were accurately and repeatedly hit--logistics bases, C2 nodes, air defense, specific units (primarily Republican Guard), but the targeting process was not initially synchronized with the ground Commanders' intentions. In the VII Corps case, the Commander understood that a certain percentage of interdiction targeting would be apportioned against his target nominations. Ground truth, however, meant Tactical Air Control Center (TACC)/Battlefield Coordination Element (BCE) recommended target lists were revised to meet "CINC priorities."¹¹ The result was a loss of faith in the target nomination process over the first two to three weeks of the air campaign. Routinely, only a handful of some twenty to thirty target nominations would be reflected in the finalized Air Tasking Order (ATO). The frustration came when other targets within the same AF "kill box" would be hit at the expense of the Corps Commander's desired targets. It was a unity of effort issue. I would suggest it is questionable that the CINC or his staff dominate the operational/interdiction level of targeting. Rather, the ARCENT/Corps "voice" should be prioritized in order to synchronize that effort with the ground maneuver campaign to come.

A second air campaign "negative" for close battle C3 was the overall lack of BDA results provided down to Corps level. This was a systemic intelligence problem causing much discussion

in the aftermath of Desert Storm. Given the C3 intelligence functions at the TAC (Chapter 2), analysis of enemy dispositions or courses of action took place either in the absence of BDA or with wildly fluctuating results. Add to that the absence of any imagery downlink equipment forward at the TAC (meaning any data had to come from the MAIN), and, again, the Commander would oftentimes be frustrated in his analysis of the close battle "shaping" situation. Tempted enemy units remained loosely confirmed or denied, and usually without accurate combat strength estimates.

Deception operations at the Corps level provided excellent C3 vehicles for the TAC to practice and refine procedures for the ground attack to come. The deception plan was designed to portray the main attack along the Wadi-al-Batin approach through a combination of forward positioning, fires, TAA activities, and communications. Meanwhile, reconnaissance and ultimate repositioning westward to attack positions would be delayed until the final days before G-Day. Throughout the first month of the air campaign, these tasks, within an overall be prepared to defend mission context, resulted in many TAC battle staff "spin ups" based on enemy movement reports, coordination of fires, and border reconnaissance/surveillance. For example, every time Joint Surveillance and Target Attack Radar System (JSTARS) picked up significant "moving target indicators" (MTIs), these "spin ups" generated all the C3 coordination necessary to attack enemy formations with AF/attack helicopter/

indirect fires should the MTI report materialize into a legitimate target within the Corps' area of influence.

Artillery raids, in particular, provided TAC C3 "rehearsal" for fire support and A2C2 coordination integral to the Corps attack plan. While the planning was done at Division and Corps Artillery levels, the TAC had to be thoroughly knowledgeable on all the ingredients in order to monitor execution and allow the Commander/G-3 the flexibility to influence the outcome even though the operation entailed predominantly Divisional assets. These raids applied doctrinal tactics, techniques, and procedures in a decide/detect/deliver methodology. First, imagery collection would confirm target locations and descriptions. Second, battery firing positions would be determined and ammunition prepositioned. Both raid and counter-battery positions would be occupied. Third, Joint Suppression of Enemy Air Defenses (JSEAD) was planned and coordinated, as well as the airspace coordination to time AF and tube/rocket artillery fires. Fourth, JSEAD and AF targeting would be executed to complement artillery fires. Fifth, MLRS battery fires would be executed as soon as the airspace was cleared. Simultaneously, Q36/Q37 radar teams would "illuminate" to detect any enemy counterbattery or countermortar radars for other tube/MLRS batteries to immediately acquire and shoot at. Sixth, firing batteries would immediately displace upon end of mission. Finally, unmanned aerial vehicle (UAV) or AF assets could be used to determine BDA. The capability to integrate AH-64 engagement areas into the raid planning existed as well. That,

in a condensed form, was the technique, and it provided superb fires coordination practice for the TAC. (C3 LL#23: Pre-ground attack deception operations and artillery/attack helicopter raids are excellent C3 opportunities to "tweak up" TAC fire coordination, A2C2, and reporting operations. Do not make those operations the exclusive domain of the Fire Support Element at the MAIN.)

A final pre-G-Day topic should be addressed before turning our attention to the TAC's C3 efforts during the ground war itself. Rehearsals for future tactical operations can oftentimes be incorporated into current operations. The VII Corps movement from TAA to attack positions, after Iraq's acquisition capabilities had been virtually blinded by the air campaign, was just such an opportunity. Few leaders present had ever maneuvered in Divisional-sized formations on the ground. The decision was made to replicate the Corps OPLAN Phase III envelopment in our movement west into final attack positions. Both the distance (roughly 110km) and the right hand turning movement were analogous to the terrain, control measures, and depth it would take us to maneuver to the templated RGFC locations in Iraq. With the 2ACR as a covering force and 1st and 3rd Armored Divisions moving abreast, the TAC and Command Group were able to rehearse the requisite C3 involved in controlling such a formation. Formation designs, mobility factors, wheeling two Divisions abreast, and maintaining communications were all validated. This last aspect, however, taught us two valuable lessons prior to G-Day. First, it was

clear that we needed to echelon the TAC to maintain communications with forward Corps units. In the next chapter, I will detail how that was accomplished. Second, we needed to further "stretch" our FM reach to get a 40-50km receive/transmit range on command net radios. Further innovations were necessary to peak an antiquated FM family of radios. Therefore, during the days just prior to the ground war, we tested ways in which to extend antenna height on selected C3 vehicles while moving. The solution came in welding Mobile Subscriber Element (MSE) crank-up antenna bases onto the side of tracked vehicles to provide a relatively stable antenna base 30-40ft up in the air while driving, a rather primitive, but effective, fix in an era of unprecedented force modernization! (C3 LL#24: Use any and all major unit pre-combat moves to rehearse the C3 architecture you anticipate relying on in combat, especially at Division/Corps levels where it is rarely "stretched" in peacetime training.)

CHAPTER 3

THE 100 HOUR GROUND WAR

A. Tempo of Operations

One might expect the ground war to provide the most protracted discussion of Corps TAC C3, but that will not be the case with this chapter. In a four day offensive operation, "plan the fight, fight the plan" is a necessary truth at the Corps level. While meeting engagements, logistical problems, weather, and other similar factors may affect the plan at task force or even brigade level, the rapid tempo of a 100 hour attack does not allow for much deviation in planning at the Corps level once across the LD/LC. TAC C3 was in the execute mode at this point, with the forces organized, positioned, supplied, and ready to attack. In fact, the only two task organization changes planned for were the only two effected. Two Corps Artillery Brigades firing in support of the 1st Infantry Division breach operation would reposition to effect a Direct Support (DS) relationship with the enveloping 1st and 3rd Armored Divisions, a case of "maneuvering fires" to achieve mass at the point of main effort. By this time (G-Day), the TAC C3 functions were defined, rehearsed, and prepared. All understood that the most tenuous C3 link was in FM communications, with the fear that maneuver might outdistance comms. Therefore, I will devote the first part of this chapter to the execution of an echeloned TAC operation.

The remainder of the chapter will attempt to capture the cardinal Corps close battle C3 features of the ground attack from H-Hour until the 28 February cease fire. I have selected (to include the TAC's echelonment) five points of analysis which will cut across the Battlefield Operating Systems: the distinction (or lack of) between close and deep battle, control/coordination of fires, joint air/ground attack coordination, intelligence gathering "on the move," and coalition forces synchronization. Each provides meaningful C3 lessons learned for heavy Corps attack doctrine.

B. Echeloning the TAC

From the rehearsal conducted during movement into attack positions, it was anticipated that FM communications would be stretched to the limit as the Corps attacked into Iraq. As it turned out, VII Corps maneuvered 300km in four days. The decision was made to echelon the TAC to enhance mobility, provide continuous communications, and minimize exposing light-skinned C3 vehicles forward on the battlefield. A TAC(Fwd) was organized with the intent to provide a Corps C3 node as far forward as the lead brigades of the 1st or 3rd Armored Divisions, or proximate to their respective Division TACs. The TAC(-) would make successive bounds further to the rear of the FLOT.

This TAC(Fwd) was simply a scaled-down, but more protected and mobile, version of the TAC. With a tank section, three M577A1 Command Post tracks, the three M113A3 Command Group

tracks, several HMMWVs, and a couple of signal vans (some 70-80 soldiers) this forward CP could operate FM on the move and set up in a stationary configuration in less than ten minutes. Single channel TACSAT was operational within five minutes, and multichannel TACSAT within twenty minutes. What is important about all this is the continuous C3 capability for units in contact along the FLOT, as both TAC echelons moved by successive bounds. The reality of rapid tempo desert operations is the capacity to move faster than the communications reach. The Corps MAIN, in effect, quickly became almost "de-linked" from the battle, and even TACs were often too slow and unwieldy to keep up with the close battle. In fact, as discussed earlier in this study, the VII Corps Commander's personal C3 "vehicle" was a UH-60 Blackhawk which could hop from Commander to Commander locations with the air supremacy we enjoyed. Whenever weather conditions precluded flying or he needed a C3 base of operations, the TAC(Fwd) provided a no frills, bareboned CP. FM communications were generally maintained throughout the four days with all U.S. Division and 2ACR TACs or command groups. Rapidly emplaced TACSAT linked the Commander with everyone else, e.g., Corps MAIN, Corps REAR, 1st (UK) Division, ARCENT, and even CENTCOM (C3 LL#25: **Rapid tempo offensive operations will dictate echelonnement of C3 to maintain communications. In the case of a heavy Corps TAC, two techniques are recommended, with different associated people/equipment costs: (1) a TAC Forward and TAC(-) organization, or (2) a TAC A/TAC B ("hot/cold") arrangement.**)

C. The Depth of the Airland Battlefield

Throughout the four days of ground combat, the distinction between close and deep battle was a continuously "blurred" one. In other words, the spatial relationship of the battlefield in depth tended to negate the separation of close, deep, and rear activities. Correspondingly, the doctrinal C3 functions of TAC, MAIN, and REAR also tended to overlap in combat. In terms of both acquisition and lethality, modern technology has provided an "extended range closure with the enemy"¹² seen in practice for the first time during Desert Storm. The TAC C3 point to be made is the functional necessity to be able to coordinate and, if necessary, control what would normally be considered "deep" operations.

Let me give an example at the TAC(Fwd) on the third night (26 February) of the ground war. Cross-FLOT AH-64 attacks were planned vicinity Objective NORFOLK against Tawakalna (RGFC) Division positions by both the 11th Aviation Brigade (Corps) and 1st Infantry Division (M). While the planning loop ran from Separate Brigade/Division to the Fire Support Cell at the MAIN, communication distances precluded any active execution role by the MAIN. Having been briefed on the attack plan via TACSAT, the TAC(Fwd), on the other hand, played an active C3 role during execution through coordination with ABCCC and, at one point, deconflicting airspace corridors between attacking AHBs. The latter was a rudimentary, but effective, order for "[1st Infantry Division] to hold at grid line 'X' until [11th Aviation] reports clear." (C3 LL#26: Depth of the airland

battlefield "blurs" hitherto held spatial distinctions between close and deep operations. TAC C3 functions must accommodate the synchronization of combat activities throughout the depth of lethality of Corps systems, i.e., be careful to not totally segregate close/deep C3 functions between TAC and MAIN.)

D. Controlling Fires at Corps Level

The Corps TAC was the pivotal C3 link in two indirect fire control measures affecting all artillery units, placement of the FSCL and coordination of cross-Corps boundary fires. Both functions were anticipated and wargamed/rehearsed repeatedly prior to G-Day. Shifting the FSCL was a FLOT-driven function, and maintaining an FSCL 40-50km out proved about right given the time-space tempo of the attack. Placement of the FSCL was an absolutely critical fire control measure as the AF was free to conduct interdiction targeting beyond that line without any coordination.

On at least two occasions, 1st Armored Division found it necessary to shoot artillery across the VII/XVIII Corps boundary. While the coordination was worked through the normal FSE channels, the LNO presence facilitated the process in both cases. The only LNO team positioned forward at the TAC(Fwd) was the XVIII Airborne Corps for immediate liaison/coordination purposes as both Corps completed their envelopment maneuver and converged vicinity of the Rumaylah oil fields. This was a good choice in retrospect. One cross-boundary fire mission was coordinated in twenty minutes, a fairly remarkable time given

the reporting levels down and back up by friendly units. (C3 LL#27: Make a distinction between "information passer" LNO and critical "flank coordination" LNO teams, and position the latter at forward echelon C3 locations to accelerate/facilitate crosstalk and flank coordination during battle.)

E. Joint (Air/Ground) Coordination

While the TAC does not (and never should be in a position to) direct CAS, it provides a valuable C3 function in providing AF combat power when and where it is needed on the battlefield. The relationship between the VII Corps TAC and ABCCC proved to be an essential linkage during the ground war. With the tremendous number of AF sorties available daily under the Joint Forces Air Component Commander's concept of "push CAS,"¹³ the "kill box" graphical control system to direct targeting, and the fluid nature of the battle, targets of opportunity continuously presented themselves. The FM communications between the TAC fires cell and ABCCC could expeditiously redirect or divert CAS sorties onto lucrative targets. While every Air Liaison Officer (ALO) at each unit level had this capability, the TAC could prioritize targeting based on the total Corps tactical situation and shift/shut down artillery fires to deconflict airspace.

In addition to the CAS coordination, the link to ABCCC enhanced other facets of joint operations: (1) provided a means of hasty air/ground coordination for shooting deep MLRS or ATACMS missions, (2) used to coordinate aerial reconnaissance of critical areas the Commander needed immediate intelligence on,

based on available assets (usually in the form of an OA-10), and (3) routinely provided another source of battlefield intelligence through monitoring in-flight crew debriefs. This TAC/ABCCC relationship did not just materialize on G-Day, but was the product of repetitive training both pre-D-Day and during the artillery raids previously discussed. (C3 LL#28: The Corps TAC/ABCCC linkage is an absolutely critical element in applying air power to ground combat, and in expeditiously coordinating/controlling execution of airspace. It should be emphasized, even if in a simulated mode, during all future BCTP exercises for Divisions/Corps.)

F. Intelligence "Feed" on the Move

The problems associated with getting intelligence information forward to the Commander at the TAC have already been discussed. Without any downlink equipment, analysis from acquisition assets (JSTARS, SLAR, Rivet Joint, Guardrail, Quicklook, ASARS, UAVs, etc.) had to be done elsewhere and the synthesized information provided verbally or by courier to the TAC. This intelligence "feed" process was exacerbated during the ground war with a FLOT change of up to 100km a day. While reports generated at lower tactical levels painted a partial picture, the absence or lateness of deeper acquisition results left the Commander without an adequate "read" on the enemy. On day two of the attack, the Corps G-2 was actually brought forward to the TAC to update the commander. This obviously is not a consistently reliable technique, a problem that technology

must answer, and, as the CINC addressed as a campaign issue,¹⁴ means critical battlefield intelligence is not getting to the maneuver commander in a timely fashion.

G. Coalition Warfare at the Operational/Tactical Levels of War

Given that interoperability is the key to successful combined operations--built on the pillars of training, doctrine, communications, and compatible force structure¹⁵--the coalition, as a whole, provided an immense challenge to synchronized combat actions. Within the VII Corps task organization on G-Day, coalition operations meant the TACON of the 1st British Armored Division. The need to maintain coordinated actions with the Northern Area Command (NAC) on the right flank, however, added another dimension to coalition warfare for the Corps. This aspect of the ground war C3 is larger than just the TAC, but I would be remiss not to address it, especially in light of projected future regional scenarios.

With the Brits, interoperability was really never an issue. Doctrinally compatible, logically coordinated into the 2d COSCOM network, and without any language barriers, the 1st Division had been training with VII Corps forces since December. Conducting a forward passage through the 1st (US) Infantry Division's breach, the British had rehearsed exhaustively with the Big Red One at an exact replica of the expected breach area constructed in the TAA. Of equal importance, a strong liaison was established. Not only did the British provide fully resourced teams (to include communications self-sufficiency) at

both the TAC and MAIN locations, VII Corps reciprocated with a team of their Division CP. (C3 LL#29: Consider employing reciprocal liaison teams with TACON coalition forces to add redundancy to C3 synchronization.)

The VII Corps and NAC attacks did not really depend on each other's success, and flank contact was done by aerial screen. In fact, the Wadi-al-Batin terrain feature effectively separated ground forces. Some interesting lessons, however, emerged over time that should be factored into any future campaign plans, especially should coalition forces fight along a closely coordinated boundary.

First, equipment types can cause an Identification Friend or Foe (IFF) challenge. For example, prior to G-Day, VII Corps passed the Syrian Division through our sector, equipped with T-72s, BMPs, and other Soviet export models. That operation was carefully orchestrated and supervised to minimize the risk of fratricide, employing more resources, soldiers, and equipment than could have ever been dedicated to that type mission in combat. Coalition equipment mixes of this sort will continue to be an interoperability problem.

Second, significant doctrinal differences can exist between coalition members. The 4th Egyptian Division, defending along the Iraqi-Kuwaiti border to VII Corps' right flank prior to G-Day, had a completely different operational concept of defense than U.S. forces. Their idea of depth, units positioned right up against the border, sharply contrasted our force array. Lacking the sophisticated, "deep" technology of western armies,

doctrinal differences with future coalition partners will, again, pose interoperability problems. Combined training exercises will go a long way in lessening this gap.

Lastly, communications--specifically liaison teams and "on the ground" coordination meetings--achieved some degree of viable interoperability between NAC and VII Corps forces. Liaison was maintained at both Corps/NAC and Division levels, and the TAC could communicate continuously via TACSAT with its LNO at the NAC CP.

While coalition interoperability at the operational/tactical levels did not play a major role in VII Corps' ground attack, nor in the TAC's C3 functions, it is not difficult to envision combined operations taking on an increasingly important role in future contingency Corps missions. Increased peacetime training exercises, narrowing the doctrinal and equipment differences, and robust liaison architecture are the keys to interoperability. And as an overarching lesson learned for future application, I will borrow the Corps Commander's words. (C3 LL#30: In the planning and employment of coalition forces under a U.S. ground commander's TACON or OPCON, assign that force missions "within its capabilities."¹⁶ Those capabilities may well be analogous to airland battle roles/missions, as in the case of most NATO armies, or will require different operational and tactical application, in the case of other coalition member armies.)

H. The Bottom Line

When all is said and done, our doctrine, equipment, soldiers and leaders, and trained readiness combined to make the ground war a highly successful operation. The C3 battlefield operating system worked, albeit with some significant "hiccups" which I have tried to capture. Commanders could apply airland battle doctrine, tactics, techniques, and procedures to control forces and synchronize the seven Battlefield Operating Systems during execution. Communications systems, however, continued to be a point of vulnerability. While mobility, lethality, target acquisition, and sustainability have improved exponentially over the past decade, our voice and record communications capability has simply not kept pace. The TAC was operating in the dark ages compared to the "shooter's" equipment.

CHAPTER 5

POST-COMBAT ACTIVITIES

A. Cease Fire Changes Mission Roles

When the cease fire was placed in effect on 28 March, Desert Storm was over (although not realized at the time) and coalition forces entered what is commonly referred to as the conflict termination phase of a campaign. On an operational/tactical level, VII Corps initiated a series of new mission roles which collectively posed a whole new set of C3 challenges at the TAC. While conflict termination has recently received much doctrinal attention at the strategic and operational levels of war, there remains a huge shortcoming at the tactical level of war.

Specifically, the Corps assumed at least six new mission roles dramatically different from those before and during the ground attack phases of the OPLAN. First, along a demilitarized line (DML) established over the entire ARCENT frontage in Iraq and Kuwait, Corps units undertook a refugee control, medical aid, and refugee camp (at Safwan airfield) operation that remained until handoff to UN peacekeeping forces. Second, the same control and evacuation mission existed for Iraqi soldiers who appeared at the DML wanting sanctuary, to include the need to disarm the majority of them. Third, applying a new set of rules of engagement (ROE), DML units maintained a screen along that line to respond to any cease fire infractions or attempts to cross the DML and retrieve military equipment. Fourth, the

requirement existed to clear certain areas where cluster bomb units had been used. The unexpectedly high dud rate from those munitions presented a troop safety and trafficability problem in terrain that forces needed to transit or occupy. Fifth, large amounts of Iraqi equipment and munitions had been abandoned by their forces and required destruction. Finally, requirements were received at Corps to preserve and evacuate selected types and amounts of equipment for a variety of reasons, ranging from museums to National Training Center OPFOR use.

From the above, it is clear that the Corps had to make a fairly radical shift in missions and rules of engagement. As XVIII Airborne Corps moved to redeployment staging areas, the VII Corps mission, in terms of space, eventually expanded to include both Corps' sectors, with a DML running over 500 kilometers long. Restraint, situational rules for application of force, and dealing with the influx of noncombatants rapidly replaced the unbridled lethality of the ground campaign.

B. Shift in TAC C3 Focus

Upon a cease fire, the "close" battle assumed new dimensions for the TAC. Opposed to airland operations in depth, the C3 focus shifted to preparedness for military response to any cease fire violations and the requisite noncombatant operations listed above. A static TAC location and Corps communications architecture replaced the tenuous C3 links that characterized the preceding four days. The DML became, in essence, a FEBA and FLOT for command and control, and

reestablished record communications (E-Mail, FAX, TACFIRE) facilitated the C3 effort. On the other hand, the shift in mission focus dictated a retooling of the TAC's organization. First, the Corps needed an operational pause based on logistical resupply needs. Second, lines of communication (LOCs) had been stretched over 300 kilometers, and some degree of reorganization and consolidation was necessary. Third, the massive problems of POW evacuation and refugee assistance required an immediate civil affairs emphasis. Finally, future tactical planning needed to be accomplished since the Corps' OPLAN had reached its culmination point. Coupled with the decision not to displace the Corps MAIN and move it into Iraq for an unknown period of time, the C3 for these new missions needed to emanate from the TAC.

Therefore, increased engineer and G-4 representation was required at the TAC, as well as an additional G-5 cell. Ultimately, a G-3 Plans van was brought forward too, giving the Commander/G-3 an immediately responsive planning capability for tactical repositioning, movements, and redeployment, the "deeper" battle at this juncture. While all this appears as a logical C3 progression, it was actually a reactive process given a changed operational and tactical environment, i.e., not previously planned for. The TAC became so enlarged that mobility was no longer a positive feature. (C3 LL#31: Post-combat activities, even if in a "be prepared for" format, must be wargamed and incorporated into the Corps OPLAN, with the changed C3 architecture requirements reflected in TAC/MAIN/REAR

mission roles and functions.) In retrospect, given a similar condition where time and space will continue to "delink" the MAIN to some degree, consideration should be given to tailoring an echeloned TAC into a tactical and post-combat activities alignment. By that I mean something akin to a tactical, DML-focused C3 node at the TAC(Fwd) and more civil affairs, CSS-focused TAC(-). In any case, retaining the capability to tailor the TAC's C3 organization, versus the "generic TAC" approach, remains the key to flexible, responsive command and control.

C. Issues to Resolve

Besides the overarching need to better plan for post-combat activities at the operational/tactical level of war, there are certain specific issues out of the Desert Storm cease fire experience that merit resolution for future Corps operations. First, should our future military strategy include refugee operations conducted by combat units, planning and training that mission role must be incorporated into peacetime activities. Second, (C3 LL#32: The increased lethality of battlefield munitions has a residual effect on post-combat operations. Areas saturated with CBUs and other similar dud producing rounds must almost be considered no ground or wheel vehicle movement areas until marked/cleared by engineer units.) Several soldiers were wounded or killed by unexploded ordinance. Third, destruction of enemy equipment will run the spectrum from caches of small arms to Silkworm missile storage facilities. Three considerations should be planned for in advance: (1) priorities

for destruction; (2) task organization to provide EAC capability for handling large kg content or special munitions; and, (3) determination of how much and what type of equipment should be retained and evacuated out of theater.

Finally, redeployment timelines may be at odds with operational requirements during post-combat activities. For instance, VII Corps adhered to a "first in, first out" criteria for redeployment; however, such an early deployer as the 2ACR provided the ideal screen unit capability required along the DML. Indeed, the Corps kept "jockeying" Divisions to occupy forward space vacated by the next redeploying unit on the list. I would only suggest that either operational requirements dictate redeployment or units should be repositioned as early as possible following a cease fire in light of redeployment timelines. Screening along a cease fire DML, with its noncombatant, military, and political ramifications, is not an easily handed off mission between different Divisional units.

The above issues and C3 interests examined in this short chapter should not be downplayed. Regional conflicts, especially in coalition terms, will not likely end in unconditional surrender. The many political, military, noncombatant, and environmental nuances of cease fire agreements and conditions will exacerbate the command and control of post-combat activities.

With the TAC's echeloned movement out of Iraq on 14-15 April, its C3 role in Desert Shield/Desert Storm came to a

close. After a whirlwind equipment turn-in, 17 April brought "wheels up" from King Khalid Military City.

CHAPTER 6

CONCLUSION

I have attempted to cover a lot of C3 ground through the analysis of the VII Corps TAC's role during Desert Shield/Desert Storm. Many of the lessons detailed here will undoubtedly be captured in Division, Corps, and ARCENT level after action reports. Hopefully, this study will assist that effort as the Army reassesses doctrine, combat developments, and mission roles in the wake of the gulf war. The synthesis of that effort is critical to the decade ahead, where the challenge of unilateral or coalition involvement in major or lesser regional conflicts remains high.

The bottom line is that the application of airland battle doctrine, in terms of tactics, techniques, and procedures, was largely validated in waging a high intensity conventional campaign. While the VII Corps C3 architecture accomplished the mission of command and control over a large, coalition offensive operation, certain fundamental issues emerge for future campaign planners to consider. With the mobility and lethality of our systems, a C3 distinction between close and deep battle does not retain any real relevance past the LD/LC. The Corps MAIN is unwieldy, and fails to effectively function during mobile heavy Corps contingency operations. Even Corps TACs require tailoring and echelonment in accordance with METT-T and Commander considerations. Antiquated communications systems cannot keep up with the rapid tempo of offensive airland operations.

On the other hand, that same mobility and lethality largely assured the success of our C3 system. Against an enemy blinded in acquisition and communication capabilities, faced with rapidly achieved air supremacy by coalition forces, and lacking the mobility to match our move to the west, the Corps C3 architecture, despite technical incompatibilities and range limitations, could basically operate with virtual impunity. Radio frequencies were never changed during the four days of the ground attack, jamming was nonexistent (unless we did it to ourselves), enemy direction finding became a diminishing concern, and the Corps was always able to fight its OPLAN. I would hesitate to join any school of thought, however, that predicted similar favorable conditions in any foreseeable conflict. For that reason, I would suggest that the weak link in our current and projected C3 system at Corps level and lower is in communications and command post vehicle systems. It is imperative that the deficiencies in both discussed throughout this study be redressed through force structure, procurement, and training initiatives.

The thirty-two lessons learned highlighted here all have solutions for future enhanced C3 execution. Some, such as the METT-T tailored and echeloned TAC, can be applied immediately in training and exercises. Others require short range, affordable fixes--codifying a fully resourced LNO system, for example. Still others will fall into a longer range, budget constrained category--services-wide fielding of interoperable MILSATCOM equipment and improved command post vehicles, to name two.

Again, each is worthy of consideration. Synchronization of the battle places a premium on the C3 Battlefield Operating System.

As a final thought, future campaign/operational planners must use the Desert Shield/Desert Storm experience as a command, control, and communications baseline for any future major regional conflict crisis action scenarios. There are those that feel that the five to six months of preparation time and theater maturation will never be available again. That may or may not be true, but is largely irrelevant. What is relevant is the belief that future large scale, conventional campaigns will be characterized by the same type of C3 challenges relative to movement, deception, combined fire and maneuver, offensive air support, rapid tempo attack, and post-combat operations. That belief is what enhances the value of important lessons learned, in this study those being of command, control, and communications from a Corps Tactical Command Post perspective.

ENDNOTES

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2. See current III Corps or V Corps Modified Table of Organization and Equipment (MTOE), following VII Corps' deactivation.
3. LTG John J. Yeosock, USA, "Army Operations in the Gulf Theater," Military Review Vol. LXXI, No. 9 (September 1991): 9.
4. Kindsvatter, 15-16.
5. U.S. Department of the Army, TRADOC Pamphlet 525-5 Airland Operations (Fort Monroe, Virginia: 1 August 1991)), 34-39.
6. LTC Joseph P. Englehardt, USA, Desert Shield and Desert Storm: A Chronology and Troop List for the 1990-1991 Persian Gulf Crisis (Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, 25 March 1991). This reference provides a detailed chronology for the reader unfamiliar with the Gulf War specifics.
7. Kindsvatter, 5.
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9. Kindsvatter, 6.
10. TRADOC Pamphlet 525-5, 15.
11. LTG Charles A. Horner, USAF, "The Air Campaign," Military Review Vol. LXXI, No. 9 (September 1991): 21-22.
12. GEN Frederick M. Franks, Jr., USA, "Approaching the Future," lecture at U.S. Army War College, 3 February 1992, Carlisle, PA.
13. LTG Horner, lecture at U.S. Army War College, 10 December 1991, Carlisle, PA.
14. Douglas Jehl and Tracy Wilkinson, "Looking for Lessons: U.S. Evaluates Tactics, Weapons of Gulf War," Los Angeles Times (24 March 1991): A1.

15. BG William J. Mullen, USA, and LTC George A. Higgins, USA, "Four Pillars of Interoperability," Military Review Vol. LXXII, No. 1 (January 1992): 46-52.

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APPENDIX A

GLOSSARY

AAR	- After Action Review
ABCCC	- Airborne Battlefield Command and Control Center
ACR	- Armored Cavalry Regiment
ADA	- Air Defense Artillery
AF	- Air Force
AHB	- Attack Helicopter Battalion
ALO	- Air Liaison Officer
AO	- Area of Operation
APOD	- Aerial Port of Debarkation
APU	- Auxiliary Power Unit
ARCENT	- Army Component Central Command
ASARS	- All Source Acquisition Radar System
ASIC	- All Source Intelligence Center
ATACMS	- Army Tactical Missile System
ATO	- Air Tasking Order
A2C2	- Army Airspace Command and Control
BCE	- Battlefield Coordination Element
BDA	- Battle Damage Assessment
BFV	- Bradley Fighting Vehicle
BOS	- Battlefield Operating Systems
BCTP	- Battle Command Training Program
C2	- Command and Control
C3	- Command, Control, and Communications
C3IC	- Coordination, Control, Communications, Intelligence Center
CAS	- Close Air Support
CASEVAC	- Casualty Evacuation
CBU	- Cluster Bomb Unit
CENTCOM	- Central Command
CINC	- Commander in Chief
COA	- Course of Action
CONUS	- Continental United States
COSCOM	- Corps Support Command
CP	- Command Post
CPX	- Command Post Exercise
CSS	- Combat Service Support
CTC	- Combat Training Center
CUCV	- Commercial Utility and Cargo Vehicle
D-Day	- Day on which hostilities commence
DML	- Demilitarized Line
DODAC	- Department of Defense Ammunition Code
EAC	- Echelons Above Corps
G-Day	- Day on which the ground war commences
FARRP	- Forward Area Rearm/Refuel Point
FAX	- Facsimile
FEBA	- Forward Edge of the Battle Area
FLOT	- Forward Line of Troops
FRAGO	- Fragmentary Order

FSCL	- Fire Support Coordination Line
FSE	- Fire Support Element
FTX	- Field Training Exercise
GPS	- Global Positioning System
H-Hour	- Hour on which an operation commences
HIMAD	- High-to-Medium Altitude
HNS	- Host Nation Support
HMMWV	- High Mobility Multipurpose Wheeled Vehicle
IFF	- Identification Friend or Foe
IPB	- Intelligence Preparation of the Battlefield
JSEAD	- Joint Suppression of Enemy Air Defenses
JSTARS	- Joint Surveillance and Target Attack Radar System
KTO	- Kuwaiti Theater of Operations
LD/LC	- Line of Departure/Line of Contact
LOC	- Line of Communication
LNO	- Liaison Officer
LTF	- Logistics Task Force
MCMS	- Mobility/Countermobility/Survivability
MCS	- Maneuver Control System
METT-T	- Mission/Enemy/Terrain/Troops Available-Time
MILSATCOM	- Military Satellite Communications
MLRS	- Multiple Launcher Rocket System
MOPP	- Mission-Oriented Protective Posture
MSE	- Mobile Subscriber Equipment
MSR	- Main Supply Route
MTI	- Moving Target Indicator
MTOE	- Modified Table of Organization and Equipment
NAC	- Northern Area Command
NBC	- Nuclear, Biological, Chemical
OPCON	- Operational Control
OPFOR	- Opposing Forces
OPORD	- Operations Order
POW	- Prisoner of War
REDCON	- Readiness Control Level
REFORGER	- Return of Forces to Europe
RGFC	- Republican Guard Forces Command
SHORAD	- Short-Range Air Defense
SINCGARS	- Single Channel Ground and Airborne Radio System
SITREP	- Situation Report
SLAR	- Side-Looking Airborne Radar
SPOD	- Sea Port of Debarkation
TAA	- Tactical Assembly Area
TAC	- Tactical Command Post
TACC	- Tactical Air Control Center
TACFIRE	- Tactical Fire Direction System
TACON	- Tactical Control
TACSAT	- Tactical Satellite
TO	- Theater of Operation
UAV	- Unmanned Aerial Vehicle
UN	- United Nations
USAREUR	- United States Army Europe